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A Bibliometric Examination of Entrepreneurial Traits in Scientific Literature

Nikolett Bosnyak-Simon
University of Pannonia

Helga Feher
University of Pannonia

Dorottya Edina Kozma
University of Pannonia

Abstract: Entrepreneurship research has increasingly recognized the role of individual traits in shaping entrepreneurial behavior and success. Despite the growing body of literature, systematic evaluations of how entrepreneurial traits are studied remain limited. This paper applies bibliometric analysis to map and synthesize scientific publications on entrepreneurial traits, identifying key research trends, influential authors, and thematic developments in the field. The study draws on data retrieved from the Dimensions.ai database, covering publications up to nowadays. Using bibliometric techniques, the analysis examines citation structures, co-authorship networks, keyword co-occurrence, and temporal trends. The results highlight the rapid growth of interest in entrepreneurial traits over the past two decades, with a concentration of research in journals focusing on entrepreneurship, management, and psychology. Among the most frequently studied traits are risk-taking, innovativeness, proactiveness, resilience, and self-efficacy, often linked to broader constructs such as entrepreneurial orientation and personality frameworks. Co-occurrence mapping further reveals clusters of research connecting traits to innovation, firm performance, and entrepreneurial intention. The findings show that the field has shifted from trait-based personality approaches toward more integrative perspectives that situate traits within social, cultural, and institutional contexts. Collaboration patterns indicate a global and interdisciplinary network, although research remains concentrated in Europe, North America, and parts of Asia. This study contributes by providing a structured overview of the evolution and current state of entrepreneurial trait research. By highlighting influential works and emerging themes, it helps scholars navigate the literature and identify underexplored areas, such as cross-cultural comparisons and the role of traits in digital and sustainable entrepreneurship. Bibliometric evidence also offers practical implications for educators and policymakers seeking to foster entrepreneurial capacities in diverse contexts.

Keywords: Entrepreneurial traits, Bibliometric analysis, Entrepreneurship research, Research trends

Introduction

The entrepreneurial traits, competences, attitudes, entrepreneurial motivations and behaviours, as well as entrepreneurial characteristics, are important determinants of who becomes a successful entrepreneur in the long term. It is clear that the existence of entrepreneurial success factors plays an important role, but it is also necessary to clarify in which combination and with which emphasis these entrepreneurial traits ensure that an individual becomes a successful entrepreneur. In recent years, academic research focusing on business management and the identification of related success factors has come to the fore both at national and international level. With the increasing number of studies in this field, there has been more emphasis on

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clarifying analyses that identify the entrepreneurial traits and individual characteristics that can be considered as the key to successful entrepreneurship.

The environment surrounding the entrepreneur (economic, social, political, legal, etc.) has sensibly changed in recent decades. Character traits and individual personality traits play a key role in how an entrepreneur reflects to these changes also under these changed conditions how he or she can successfully sustain his or her business in the long term. In addition, high entrepreneurship is a key driver of economic growth and job creation and can provide the entrepreneur with potential career opportunities (Mubarka et al., 2012).

The running and management of the business can be learned, according to Drucker (1985). With the emergence of entrepreneurship as an independent scientific field, the role of entrepreneurship education in higher education has increased, making higher education institutions that offer entrepreneurship majors or specializations play a key role in training socially and economically responsible professionals (Salamzadeh & Farjadin, 2014). Researchers have also focused more attention on this topic (Kusmintarti et al., 2016), as they have recognised the key role of entrepreneurial characteristics. In their study Hofmeister-Tóth et al. (2016) explicitly identified the exploration of entrepreneurial leadership characteristics as an interdisciplinary research topic.

This paper takes a novel approach regarding the emergence of entrepreneurial traits and characteristics in literature. The main objective is to identify which entrepreneurial traits have been identified by the most internationally cited authors who published on the subject and whether there appeared any traits that have been identified as relevant by all researchers. A further objective of the research is to present results that provide an accurate picture of citation relationships in this field based on international literature.

To achieve the stated objectives, the authors of the paper first review the international literature related to entrepreneurial traits, with a particular focus on the entrepreneurial traits identified by eminent researchers in the field. This is followed by an analysis of publication relationships using bibliometrics, a subfield of scientific metrics. Bibliometrics is an excellent tool to explore the interrelationships between different literature publication databases (van Eck & Waltman, 2014), to identify the citation networks between authors and the countries that have a close publication collaboration in the resulting network of relationships.

Literature Review, Theoretical and Conceptual Framework

In terms of profit-generating business initiatives, we can distinguish the outstanding entrepreneurs of the first half of the twentieth century, such as Rockefeller, Ford, Alkaringi, and their entrepreneurial models, as well as the outstanding representatives of the second half of the century, such as Bill Gates, Berne, Larry Page, and David Filo (Abood et al., 2014). Even by today's standards, these entrepreneurial geniuses were major figures of their time. In their case, researchers have not been able to identify – one or a few – specific common traits that possibly could determine their success. Researchers have found that these outstanding individuals possessed a capacity for continuous learning, which significantly influenced the development of their entrepreneurial traits and skills (Dyer et al., 2011).

In the literature on the subject, there are several definitions of an entrepreneur. According to Chen et al. (2006), an entrepreneur is a person who takes the risks of starting and running a business, and in most cases does so using his or her own resources. Van Ness & Seifert (2016) claimed that entrepreneurs are individuals who risk their personal capital, time, and reputation to make their business venture a success.

The scientific study of entrepreneurship and entrepreneurial traits came to the fore following the reassessment of the role of small businesses in the 1980s and 1990s. Initially, the explanatory factors of entrepreneurship were only personal characteristics, later complemented by entrepreneurial skills, which are highly dependent on cultural and institutional conditions (Wennekers & Thurik, 1999). There is still a lot of relevant international and national research on entrepreneurship. The authors of the multidisciplinary and therefore quite varied literature on the subject have sought to identify the personality traits of the successful entrepreneur, but there is still no consensus on the definition of fundamental characteristics (Gartner, 1989).

While some researchers have focused on the identification of innate and learned entrepreneurial traits (e.g. the need for control and achievement) that can be developed through education and training (McClelland, 1961), others have analyzed entrepreneurial traits in the longer or shorter term (Ajzen, 1991). Lucas, in a study published in 1978, concluded that individuals with a wider range of entrepreneurial traits are more likely to start their own firm in the future, ultimately maximizing both output and individual profits (Lucas, 1978).

In the literature on the monitoring of entrepreneurial traits, empirical studies of entrepreneurial characteristics and traits have been increasingly emphasized since the 1980s (Cooper et al., 1988). According to Hornaday (1982), the individual characteristics necessary for entrepreneurship are self-confidence, optimism, prudent risk-taking, positive response to challenges, adaptability, market knowledge, independent thinking, knowledge, persistence, a need for performance, initiative, dynamism, patience and, finally, a vision for the future. Peterson (1985) identified opportunity-seeking as the most important trait, while Gibb (1993) stressed the importance of risk-taking and entrepreneurship. Chen et al. (1998) focused on starting one's own business and identified entrepreneurial self-efficacy as a key personal entrepreneurial trait.

Studies on entrepreneurial behavior have identified different influencing factors, which can be social, environmental and individual characteristics as well (Gurol & Atsan, 2006). The social factors' model examined the importance of personal and family background, career, and early life experiences (Gibb, 1993). The environmental factors' model analyzed the value of wealth, tax benefits, indirect benefits, and the impact of market conditions (Alstete, 2002). The individual traits' model focused on the personality characteristics of entrepreneurs (Koh, 1996). The latter model assumed that entrepreneurs possess such unique traits, attitudes and values that provide a continuous charge and momentum throughout their entrepreneurial existence, in fact, these factors distinguish them from others (Thomas & Mueller, 2000). It can therefore be concluded that individual personality traits play a vital role in entrepreneurial activities, greatly influencing the performance and success of entrepreneurs at all stages of the entrepreneurial process (Brockner et al., 2004).

Based on Kiggundu's (2002) study, it can be concluded that the study of individual characteristics alone is not sufficient to fully explore the reasons behind entrepreneurial success or failure. Shane (1992) argued that different entrepreneurial characteristics can be identified in different countries, which have a bearing on success. Mueller et al. (2002) have shown through their research that individuals socialized in distinctly masculine cultures (USA, Canada, UK) are psychologically more prone to entrepreneurialism. Individuals with different entrepreneurial characteristics are strongly influenced by the social and societal characteristics of different countries, as well as by national culture (Tajeddini & Mueller, 2008). Mueller (2004) has reached a similar conclusion in his research. The emergence of entrepreneurial characteristics may therefore vary across countries and cultures, as supported by the research of Farrington et al. (2012).

Baum and Locke (2004) investigated the relationship between entrepreneurial traits (characteristics), skills and motivation in relation to future business growth. In a six-year longitudinal study, they collected data from sole proprietors, corporate managers and co-entrepreneurs in each industry. Their research revealed the importance of entrepreneurial traits such as passion, perseverance and the ability to manage new resources well, which were found to be indirectly related to business growth.

In their research, Ardichvili et al. (2003) assessed entrepreneurial personality traits in terms of their contribution to entrepreneurial success. Their work demonstrated that two specifically named personality traits are associated with the perception of the potential for success, namely optimism and creativity. In contrast, Rasheed and Rasheed (2004) identified several important psychological traits as indicators of entrepreneurial behaviour. However, the Kristiansen and Indarti (2004) author pair have been quite critical of attempts to study entrepreneurial behavior (attitudes), as their research has failed to identify specific personality traits that are key to successful entrepreneurship. These results were also previously concluded by Shaver and Scott (1991), who in their research experiments pointed out the serious shortcomings of the psychometric tests that were being used, stressing that they failed to distinguish between most of the traits. It is important to highlight, however, the landmark study written by Kristiansen & Indarti (2004), which highlighted the crucial role of individual attitudes in the identification and prediction of entrepreneurial traits and personality characteristics.

Schroeder and Rodermund (2006) concluded that family background, parental pattern and educational attainment can predict individual evolution towards entrepreneurship. They found that environmental and demographic factors have a significant impact on the development of entrepreneurial personality types. Pillis & Reardon (2007) found that high achievement motivation and a positive self-image are the most important factors that make an entrepreneur successful. Zimmerer et al. (2008) also identified several entrepreneurial personality traits such as high willingness to take responsibility, need for immediate feedback, high energy level, future orientation, value of performance over money, commitment, flexibility, persistence, and preference for moderate risk. However, the latter is highly relative, as Shane's (2003) research has shown that individuals' attitudes towards risk are not the same. Entrepreneurship is inherently high risk, so risk tolerance in terms of individual characteristics plays a crucial role in entrepreneurial activities.

Cools and Broeck (2007) argued for the identification and assignment of groups of entrepreneurial traits in the first place, arguing that this method can be more useful for assessing the personality of the entrepreneur than focusing on a single salient trait. Karimi et al. (2011) also argued that identifying a larger group of traits is more important than determining a single entrepreneurial trait.

According to Chell (2008), the identification and exploitation of entrepreneurial potential depend on several factors, both for start-up, i.e. practical purposes, and for research purposes, i.e. theoretical purposes. The researcher emphasized the recognition of opportunities, independence, self-efficacy, social leadership, intuition and having a vision regarding the future (Chell, 2008). In their research, Duckworthe et al. (2007) examined the importance of courage as a non-cognitive trait. In addition to courage, other traits such as creativity, high emotional intelligence, charisma, self-confidence, emotional stability, and physical attractiveness were identified in their study of highly performing individuals.

Although the role of individual characteristics in unlocking entrepreneurial potential is considerable, studies over the past decade have shown that economic, financial, and socio-cultural factors play an equally decisive role (Vob & Muller 2009). Ali et al. (2010) argued in their study that entrepreneurship development, and within it the development of entrepreneurial characteristics, is the responsibility of higher education institutions. Related to this, Van Eeden et al. (2005) conducted research to report on the development of business (entrepreneurial) attributes and knowledge of university students and to investigate whether differences in the development of entrepreneurial attributes and skills could be identified across countries. Through their results, they demonstrated that the educational environment and the quality of entrepreneurship education in each country play a key role in the development of entrepreneurial qualities. Following their research, Salamzadeh & Farjadin (2014) proved that companies founded by alumni university students have a great impact on the socio-economic development of a given economy.

Akmaliah et al. (2012) defined entrepreneurial attributes as characteristics that motivate and enable an individual to embark on the challenging process of starting a business. Farrington and his co-authors (2012) argued that it is the different entrepreneurial traits, personality characteristics that really distinguish entrepreneurs from others. As a summary of the literature review section, the theoretical definitions presented by the researchers/authors are summarized in Table 1 in chronological order.

Table 1. Chronological overview of identified entrepreneurial characteristics

Name of author(s)	Year	Identified entrepreneurial characteristics
Chen et al.	1998	self-efficacy
Shane	2003	willingness to take risks
Ardichvili et al.	2007	optimism, creativity
Duckworth et al.	2007	courage, creativity, high emotional intelligence, charisma, self-confidence, emotional stability, physical attractiveness
Pillis and Reardon	2007	high achievement motivation, positive self-image
Zimmerer et al.	2008	willingness to take risks and responsibilities, need for immediate feedback, high energy level, future orientation, valuing performance over money, commitment, flexibility, perseverance
Chell	2008	recognising opportunities, independence, self-efficacy, social leadership, intuition, positive vision

A review of the academic research on this topic reveals how the emphasis on the key characteristics of the entrepreneur has shifted over time. While individual characteristics have emerged as key factors, we cannot overlook the individual's parental and family patterns, the quality of education, which may be a factor influencing the evolution of entrepreneurship. These sociological and demographic factors (characteristics) alone have a significant impact on the development of entrepreneurial personality types.

Methodology and Conceptualization

From the 21st century onwards, researchers have at their disposal a variety of software, electronic interfaces and platforms, as well as a wide range of well-qualified literature databases that provide a systematic repository of publications. These have contributed significantly to the explosion of disciplines dealing with the analysis of the processes of the scientific world, including bibliometrics and science metrics.

Table 2. Categorisation of bibliometric-based studies

Name of author(s)	Year	Purpose	The subject of the study	Database
Cancino et al.	2017	Identifying the most productive and influential universities in innovation research	Studies filtered by keyword "Innovation" (1989-2013)	Web of Science
Khalife et al.	2020	Analysis of the history of research on project management	Publications related to project management (1980-2019)	Web of Science
Hamidah et al.	2020	Analysis of the scope of COVID-19 research	3,513 studies (2019-2020)	Scopus
Yuetian et al.	2020	Analysis of literature on COVID-19	3,626 publications on COVID-19	Web of Science
Fan et al.	2020	Exploring the difference between COVID-19-related publications in English and Chinese medical/scientific journals	143 English and 721 Chinese articles	English and Chinese databases
Ullah and Saeed Ullah	2020	A Journal of Medical Sciences Peshawar's bibliometric analysis (2014-2018)	322 scientific papers	Journal's website and print copies
Sweileh	2020	Evaluation of research activities on climate change and health, with a special focus on communicable diseases	4,247 health-related and 1207 infection-related literature (1980-2019)	SciVerse Scopus
Fei et al.	2022	Analysing current state of research on delirium (cognitive impairment)	Top 100 most cited studies	Web of Science
Zuccolotto Pessin et al.	2022	Introduction to the theoretical framework (evolution) of scientific mapping and bibliometric analysis	Various visualization options (HistCite, CiteSpace, BibExcel, Vosviewer, SciMat, Proknow-C)	-
Abdullah et al.	2022	Assessing global TB research trends and performance	Literature related to TB research (2011-2020)	Web of Science
Atsiz et al.	2022	Analysis of the number of years spent in tourism	60 studies from the field of tourism	Web of Science

Bibliometrics is a scientific analytical method that uses a wide range of statistical tools to examine and analyse a set of publications, studies, books and other scientific writings (van Eck & Waltman, 2014). Two main areas of research and mapping on bibliometrics can be distinguished: the study of the impact of similarity measures and graphical representation. When constructing bibliometric maps, researchers investigate the effect of similarity measures and typically experiment with mapping techniques (van Eck & Waltmann, 2009). Graphical

representation of bibliometric maps has received considerably less attention in academic work (van Eck & Waltman, 2010), although some researchers, such as Skupin (2004), have also exhaustively studied issues related to representation. The visualisation reveals the citation relationship between clusters.

Authors in the international literature on bibliometrics have made extensive use of this method for mapping network systems across a range of disciplines. The studies analysed are summarised in Table 2, according to which authors, in which year, with what central aim, what was analysed and based on which database, using the bibliometric method.

Based on the research summarised in Table 2, it can be concluded that mapping based on bibliometrics can be applied to a wide range of disciplines, such as medicine, social sciences, humanities and their various sub-disciplines. The present research aims to investigate entrepreneurial characteristics within the subfield of management and organization sciences using the bibliometric method. It analyses these characteristics from three different angles: institutions, countries and the number of citations of the authors of the publications. The aim of the study is therefore to assess the volume of research and trends in scientific publications closely related to this topic.

The research focused on the following two questions: Q1: Which country has the largest publication network of academic publications on entrepreneurial characteristics? Q2: Can common characteristics of entrepreneurial personality traits be identified in the studies of the most cited authors? The hypotheses related to the research questions formulated above are the following, and their validity will be tested in the analyses: H1: In terms of countries, the United States has the most extensive publication network. H2: In the studies of the most cited authors, common traits of entrepreneurial personality traits can be identified.

For the most cited studies, it was analyzed whether the authors with more than 1,000 citations identified the same entrepreneurial personality traits in their studies. Through the country-level analysis, the countries whose researchers published and cited the highest number of papers were prioritized. This also sheds light on the reasons leading to higher citation counts. The research search strategy was based on the Dimensions database (www.dimensions.ai), which is currently the world's largest interconnected research information database. The data set exported from the Dimensions database is uniquely suited to provide the bibliometric software used in the study with an input that can be imported in a processable state and in an orderly structure without modification. The exact process of searching the dimensions.ai database is illustrated in Figure 1.

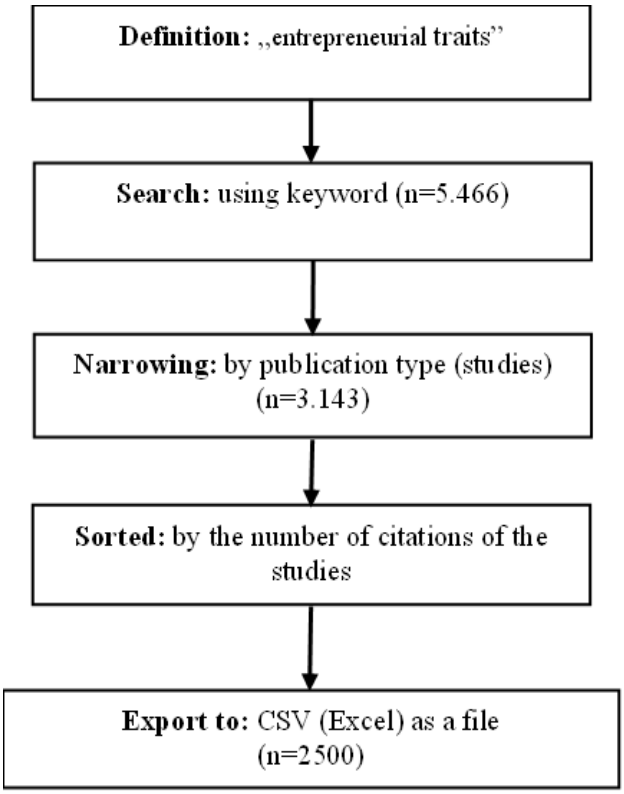

Figure 1. Flowchart for searching the www.dimensions.ai database

As can be seen in Figure 1, the limitation of this database is that it allows the export of the first 2500 studies by default, and the database thus produced is the basis of the research. After downloading the data table, the bibliometric analyses were carried out using the freely available bibliometric mapping software VOSviewer developed by Van Eck & Waltman. The program generates maps based on the co-occurrence matrix of the dataset obtained from the queries, thus allowing them to visualise the existing networks of relationships in different ways according to the aspects to be analysed (see for example institutions, countries, studies). The maps are produced using the VOS (visualisation of similarity) mapping technique, which can be seen as an alternative to multidimensional scaling (Van Eck & Waltman, 2007).

The research underlying the present study highlights the authors, institutions and countries with the most citations that can be grouped into clusters based on the same characteristics. The collaboration observed in these clusters is essential to improve scientific performance and to develop and deepen international relations. For this reason, the authors have researched the term "entrepreneurial traits" in international literature. The focus of the research was on entrepreneurial traits, and therefore a bibliometric analysis was carried out exclusively on this vocabulary. Synonyms of this term and other substitute terms referring to the subject were not included in the present study. The exact flow of the analysis in VOSviewer is illustrated in Figure 2.

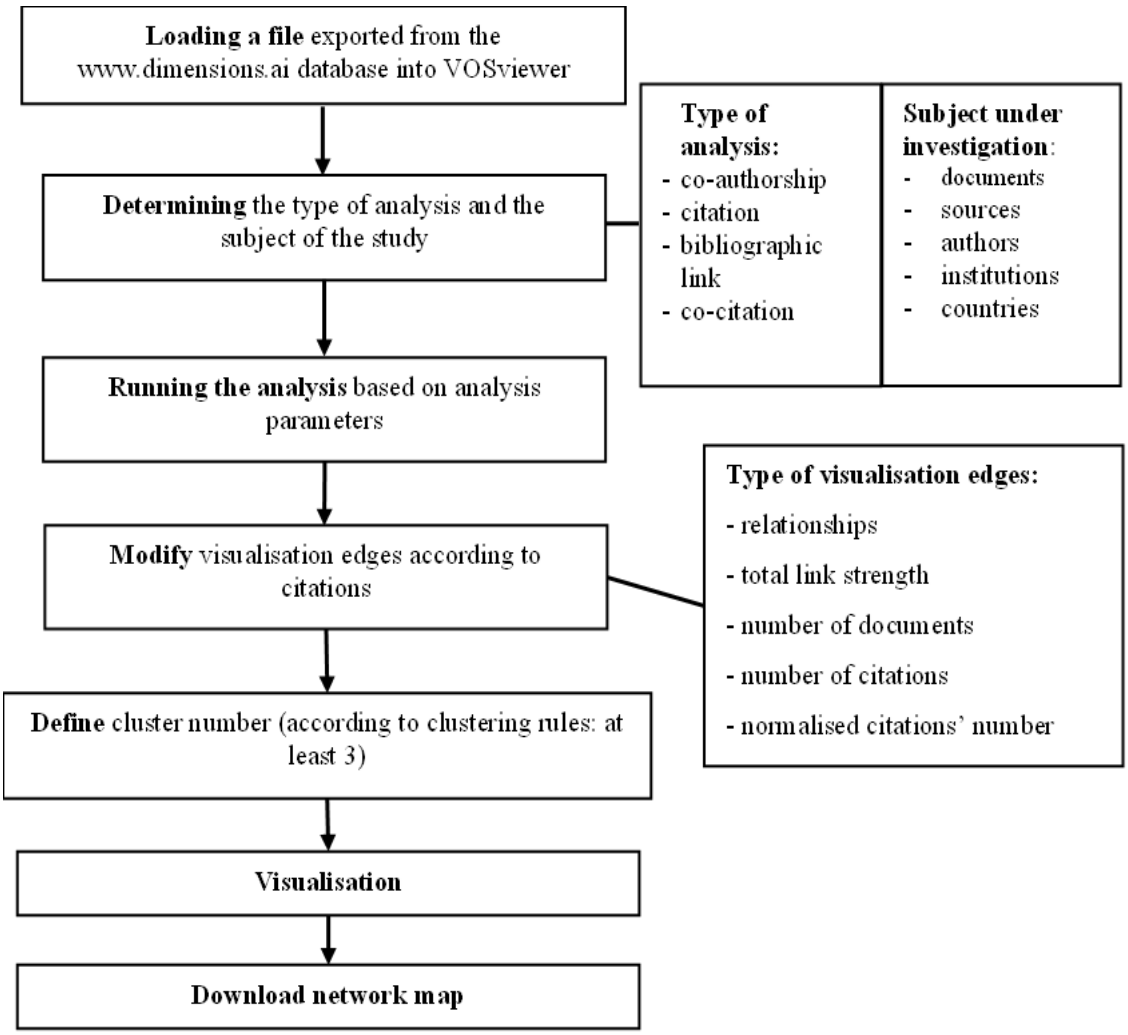

Figure 2. The VOSviewer's map creation flowchart

Anticipating the research findings, the analysis identified both cooperation and competition between countries.

Research Findings, Results

Before presenting the results of the bibliometric analysis, Table 3 illustrates the studies included in the sample in terms of the journals and disciplines in which they were published.

Table 3. Top 10 most active journals in the results list based on entrepreneurial characteristics

Ranking	Journal name	Scimago classification	Country	Number of publications	Field of expertise of the journal
1.	International Journal of Entrepreneurial Behaviour and Research	Q1	United Kingdom	80	Business, management and accounting
2.	Entrepreneurship Theory and Practice	Q1	United States	77	Business, management and accounting; economics, econometrics and finance
3.	Journal of Business Venturing	Q1	United States	68	Business, management and accounting
4.	Small Business Economics	Q1	Netherlands	57	Business, management and accounting; economics, econometrics and finance
5.	Education + Training	Q1	United Kingdom	51	Business, management and accounting; social sciences
6.	International Entrepreneurship and Management Journal	Q1	United States	47	Business, management and accounting
7.	Journal of Small Business & Entrepreneurship	Q2	United Kingdom	46	Business, management and accounting
8.	Journal of Small Business Management	Q1	United Kingdom	46	Business, management and accounting
9.	Journal of Small Business and Enterprise Development	Q1	United Kingdom	37	Business, management and accounting
10.	The Journal of Entrepreneurship	nem rangsorolt	United States	36	Several scientific disciplines

Table 3 shows that of the 10 most active journals identified, approximately one-fifth (545) of the 2500 publications included in the study were published in the identified journals. The remainder of the scientific publications (1955 publications) were distributed among a further 1091 journals. Within this total, 90 journals contained between 6 and 34 publications, while 1001 journals contained less than 5 publications for the term under study.

From a disciplinary point of view, the publications under review cover the fields of commerce, management, tourism, services, business, economics, psychology and cognitive sciences. The top ten most active journals in the hit list include six from Europe and four from the United States. Table 3 also shows the serialisation, i.e. the ranking of journals according to the Scimago Journal ranking. Unsurprisingly, the vast majority of the top 10 journals in each criterion have the highest ranking of Q1. This suggests that research into entrepreneurial characteristics is a focus of interest for both authors and journal editors.

The authors of the study during their bibliometric analysis first carried out a reference-based analysis of the institutions (universities, research centres). The results obtained showed that academic research on entrepreneurial characteristics is led by US-based higher education institutions, demonstrating the dominant academic role of US universities worldwide. However, the top ten universities with the most citations include two European universities (Erasmus University - Rotterdam, Netherlands; Jönköping University - Jönköping,

Sweden), one Canadian university (University of Toronto) and one Australian university (University of Melbourne). Leading the way is the University of Pennsylvania (3248 citations), followed by Erasmus University (3109 citations) and Rensselaer Polytechnic Institute (2861 citations) in third place. The clustering of these research centres and universities is illustrated in Figure 3.

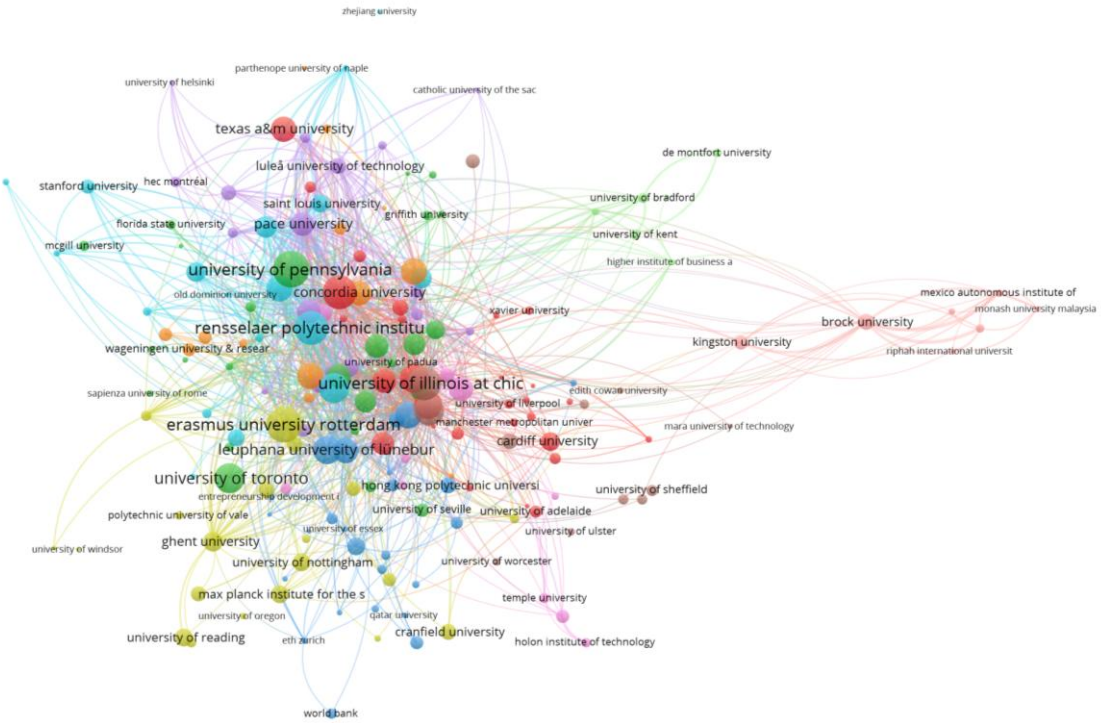

Figure 3. Location of universities and research centres in clusters on a database of publications on entrepreneurial characteristics

The clusters that emerge reveal an international network of collaborating universities and institutions that show a high level of cooperation in terms of publications. For the ten most cited authors (Table 4), it can be concluded that they tend to be active in universities, higher education institutions or research institutes with the most significant international publication links according to country classification.

Table 4. The ten most cited authors in the database of publications on entrepreneurial traits

Rank	Author's name	Number of Citations	Number of Contacts	Number of Studies	University
1.	Locke, Edwin	2503	238	5	R.H. Smith School of Business, University of Maryland (USA)
2.	Frese, Michael	2480	123	8	Asia School of Business, University of Lueneburg (GER)
3.	Baron, Robert	2131	144	13	Oklahoma State University (USA)
4.	Gartner, William	1771	58	7	Babson College (USA)
5.	Hmieleski, Keith	1705	102	9	Neeley School of Business, Texas Cristian University (USA)
6.	Shepherd, Dean,	1573	77	11	University of Notre Dame (USA)
7.	Cardon, Melissa	1327	145	9	University of Tenessee (USA)
8.	Audretsch, David	1212	52	8	Institute for Development Strategies, Indiana University (USA)
9.	Patzelt, Holger	1000	42	6	TUM School of Management, Technical University of Munich (GER)
10.	Obschonka, Martin	937	154	14	University of Amsterdam (NED)

No major outliers in the number of published papers can be identified, but there are some authors (including E. A. Locke) who have achieved a high number of citations with a relatively small number of papers in their field.

In their case, therefore, it is not the high number of publications that leads to the highest number of citations, but the scientific value and significance of the results of their study. When exploring citation relationships between countries, international research cooperation can be detected between countries that are part of the same cluster, i.e. a homogeneous group. The authors have designed the clusters according to the rules of the clustering procedure, where at least 3-4 countries are included in a cluster for ease of interpretation. The map drawn from the data is illustrated in Figure 4.

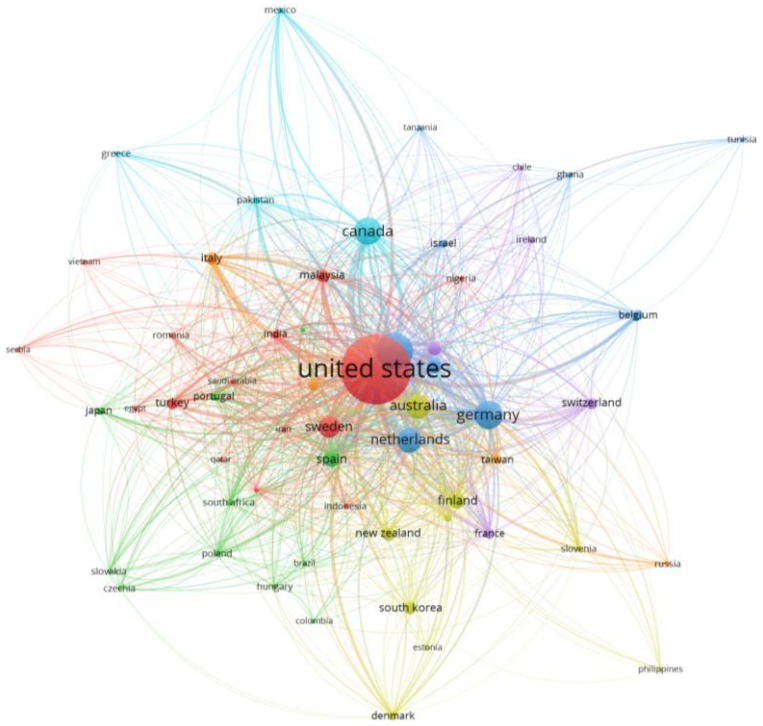

Figure 4. Cross-country citation trends in the database of publications on entrepreneurial characteristics

The map in Figure 4 focuses on the countries with the largest node size, such as the United States (49,190 citations), the United Kingdom (13,491 citations), Canada (7,363 citations), Australia (6,176 citations), Spain (2,773 citations), China (1,754 citations) and Italy (1,648 citations). Consequently, these countries have the most pronounced citation links, while the countries with the smaller node have the most modest international research cooperation in the field of research on entrepreneurial characteristics.

The clustering by country also shows the prominent scientific role of the United States. In terms of the number of elements in the clusters, the cluster with the US centre is the group that includes the most elements (countries). Among the countries in the cluster, for example, Nigeria, Vietnam and Egypt are much further away from the US in terms of citation links, indicating weak international research cooperation. On the other hand, Sweden, Iran, India and Malaysia are much closer to the cluster centre in an imaginary circle (the distance is therefore shorter, indicating the strength of the link). The map shows that these countries have stronger international research cooperation with the US that is at the centre of the cluster.

In terms of inter-country relations, Canada has weaker research cooperation with countries in the outer circle, such as Mexico and Greece, but stronger international relations with Pakistan in terms of the number of citations between them. The prominence and visualized centrality of the resulting cluster centres is confirmed by the Scimago Top 50 world ranking. The countries on which the research is based are all included in this authoritative ranking. The validity of the results obtained has been confirmed by other authors, such as Mester (2016), who also compared the countries with the most citations in the world with the Scimago world ranking.

The results so far have shown that in many cases organisations (universities, research centres) have very close international cooperation on entrepreneurial characteristics. It can also be noted that the number of citations between authors of the studies included in the study varies considerably. The bibliometric analysis from the authors' point of view, after creating and analysing the database and displaying the map, clearly showed that eight authors actively working on the topic had a citation count of 1,000 or more, while the other researchers had a more modest number of citations. In the studies examined, there can often be large differences in the

number of visually formed edges, i.e. the number of identifiable links between the authors of the studies. This phenomenon can be discovered in Figure 5.

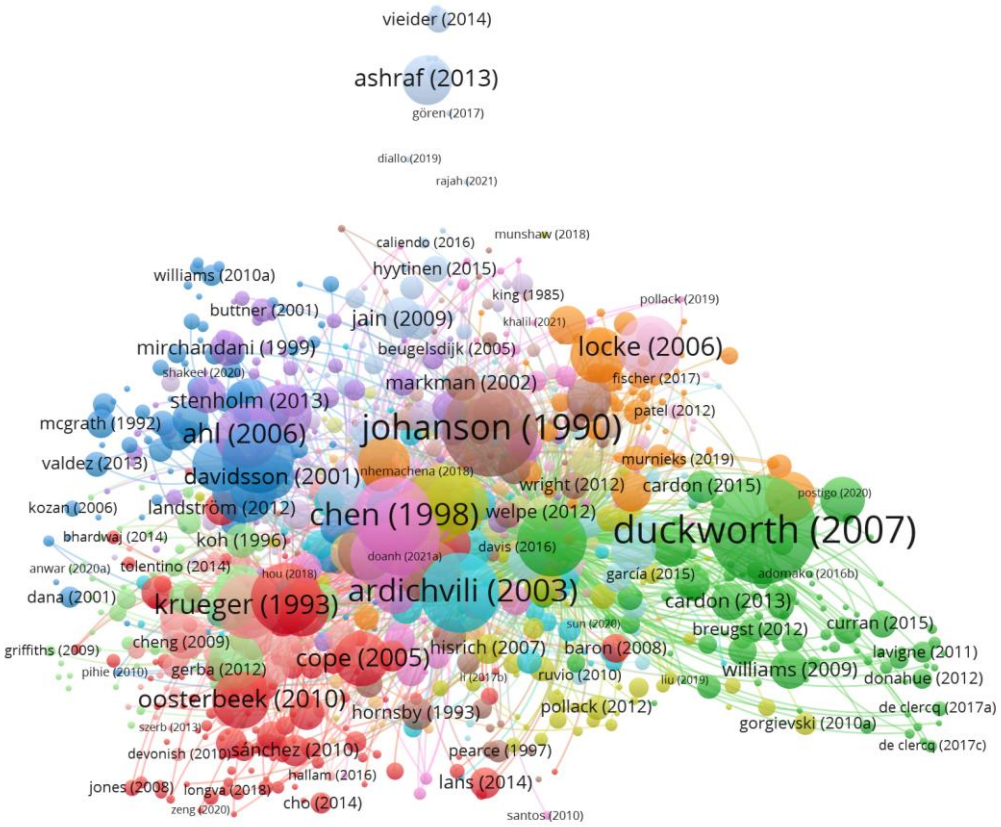

Figure 5. Cross-references between studies in the database of publications on entrepreneurial traits

The highlighted nodes in Figure 5 represent the authors of the most cited papers with significantly more citation links. The general conclusion is that authors who are located further apart have weaker citation links, while publication activity, i.e. citation links, between authors who are located closer are stronger. In this section of the analysis, the authors of the study draw conclusions on the publications of the clusters formed by the method described, which are ranked first in the number of citations. From a substantive point of view, the most cited studies can be divided into three main theoretical groups according to the prominence given to entrepreneurial characteristics. The publications in the first group were clearly aimed at exploring these characteristics. The studies in the second set focused on a fundamentally different topic but dealt to a lesser or greater extent with entrepreneurial characteristics. In the remaining articles, this word combination was only tangentially mentioned.

Research by Chen et al. (1998), Ardichvili et al. (2003), Duckworth et al. (2007), and Baum and Locke (2004) has clearly focused on identifying and examining entrepreneurial traits. Their publications mainly analyze these characteristics in relation to the creation of successful businesses. As highlighted in the theoretical bulk of this study, Duckworth et al. (2007) in their research demonstrated the importance of several relevant attributes that are essential for the creation and long-term operation of a successful business, such as courage, creativity, high emotional intelligence, charisma, self-confidence, emotional stability, and physical attractiveness.

Chen et al. (1998), – as already presented in the literature review – identified entrepreneurial self-efficacy as a defining personality trait, and also highlighted the general conclusion that entrepreneurship researchers have long been searching for individual characteristics of entrepreneurs, which they have examined in depth in relation to self-efficacy and have diverted attention away from the need for performance and control. This novel approach to the exam topic explains how the article by these authors has become one of the most cited studies.

In their study, Ardichvili et al. (2003) identified and rethought entrepreneurial opportunities, personality traits, social networks and prior knowledge of the entrepreneur based on existing theoretical and empirical research. Entrepreneurial personality traits/characteristics were assessed in terms of their contribution to entrepreneurial

success. In the view of these authors, optimism and creativity have been shown to be related to the recognition of the potential for success, as highlighted in the literature review of this study.

The authors Baum and Locke (2004) used structural equation modelling techniques to uncover a network of relationships focusing on entrepreneurial characteristics. This network identified the determinants of entrepreneurial characteristics and the impact of these characteristics on firm growth. The traits identified in the theoretical summary, such as passion, perseverance and the ability to manage new resources well, are directly influenced by goals, self-efficacy and communicated vision, while the defined traits have an indirect influence on the future growth of the company. Baum and Locke found that communicated vision and self-efficacy are directly related to goals, and persistence to the ability to manage new resources well.

As a kind of transition, we can look at the studies of Shapero (1982), Krueger and Brazeal (1994), Wennekers & Thurik (1999), and Zhao et al. (2005), which did not focus specifically on entrepreneurial traits, but only tangentially addressed the topic. Krueger and Brazeal (1994) investigated the existence of entrepreneurial traits prior to the revival of entrepreneurship, which had been little measured until then. Researchers have found that these traits can be linked to random profiles of several personality traits and demographic characteristics. Also related to personality is Shapero's (1982) conceptualisation of the propensity to act as a stable trait. The aim of the study by Zhao et al. (2005) was to investigate the role of self-efficacy in influencing students' intention to become entrepreneurs. In their work, structural equation modelling was applied to a sample of university students, and the results showed that self-efficacy plays a relevant role among entrepreneurial traits, like the results obtained by Chen et al. (1998). The third group of publications with the most citations merely mentions entrepreneurial characteristics. An example is the study by Johanson and Vahlne (1990), in which the authors referred to entrepreneurial characteristics in the context of the internationalisation of firms.

Conclusion

The present study focused on the bibliometric analysis of the entrepreneurial trait's vocabulary in international academic journals. In exploring the publication linkage in the given subject area, the authors of the study sought to find out whether the most cited authors share common characteristics of entrepreneurial personality traits in their studies, and which countries have the largest publication linkage network in terms of academic publications on entrepreneurial characteristics. The analyses were carried out in terms of institutions, countries and the number of citations of the authors of the publications.

Based on the Dimensions database, a bibliometric literature search of the vocabulary of entrepreneurial traits reveals a number of findings. The publications in the research sample (n=2,500) were published in academic journals with different disciplinary interests. In terms of the Scimago Journal ranking, these journals are ranked in the highest academic category (Q1) with two exceptions - Journal of Small Business & Entrepreneurship and The Journal of Entrepreneurship. This rating of journals may also indicate a strong preference for research investigating entrepreneurial characteristics, not only among authors but also among journal editors.

In their bibliometric analysis, the authors first carried out a reference-based analysis of institutions (universities, research centres). This confirmed that the top ranking for research on entrepreneurial characteristics is led by higher education institutions in the United States of America, while Erasmus University in Rotterdam and Jönköping University in Sweden also made it into the top ten. In addition, the ten most cited authors are typically from American universities and research institutions. On this basis, a parallel can be drawn between the institutions with the most citations and the authors with the highest number of citations. An unforeseen but noteworthy result of the present study is that among the authors of the studies examined, one researcher (Edwin A. Locke) achieved a high number of citations with a relatively small number of papers that included significant, novel research in the subject area.

The results of the research question on the cross-national network of scientific publications in the subject area under study showed that the United States, the United Kingdom, Canada, Australia, Spain, China and Italy are considered as countries with a central feature, thus demonstrating that these countries have a significant international publication network in the subject area. It is indisputable that most research – especially in business – is done in the United States of America, due to the large number and prestige of its higher education institutions. Consequently, the results of the analyses carried out for the countries clearly proved hypothesis H1 wich states that the US plays a central role in scientific publications on entrepreneurial traits.

The map created with the help of the VOSviewer visualisation software shows most of the edges running out from these countries, representing the publication links that have been established. The prominent position of the cluster centres in the research and publication systems resulting from the analysis is confirmed by the Scimago Journal Ranking, which places these countries at the top of the ranking. Countries at the outer periphery of the clusters have a much looser international publication network, while scientific research cooperation is significantly stronger in countries at the centre of the clusters.

In terms of author citation counts for publications, the results of the analysis showed that the top eight authors actively working on the topic had a citation count of 1,000 or more, with the remaining researchers having lower citation counts. A review of the most cited studies shows that their authors identified different entrepreneurial characteristics. Consequently, the results obtained refute hypothesis H2, as no single common or named entrepreneurial trait can be defined based on the 10 most cited studies in the sample. Chen et al (1998) identified entrepreneurial self-efficacy as a key personal entrepreneurial trait. According to Ardichvili et al. (2003), two personality traits have been shown to be related to the recognition of the potential for success: optimism and creativity. In their research, Duckworth et al. (2007) investigated courage as a non-cognitive trait in their study, such as creativity, high emotional intelligence, charisma, self-confidence, emotional stability, and physical attractiveness.

Overall, the results of the bibliometric analysis of the present study, the mapping of the networks of contacts, revealed the surprising fact that the reference system of the subject, which has been intensively researched for several decades on the national and international scene, is based on the studies of only eight authors. In addition to the achievement of the set objectives, the study will provide a literature basis for future research on the topic, as the results will contribute greatly to the mapping of publication-authorship relations in the field.

Scientific Ethics Declaration

* The authors declare that the scientific ethical and legal responsibility of this article published in EPESS journal belongs to the authors.

Conflict of Interest

* The authors declare that they have no conflicts of interest.

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Author(s) Information

Nikolett Bosnyak-Simon
University of Pannonia
Egyetem street 10, Veszprém, H-8200, Hungary

Helga Feher
University of Pannonia
Egyetem street 10, Veszprém, H-8200, Hungary

Dorottya Edina Kozma
University of Pannonia
Egyetem street 10, Veszprém, H-8200, Hungary
Contact e-mail: *kozma.dorottya.edina@gtk.uni-pannon.hu*

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